SEMESTER S5

DESIGN OF MANUFACTURE

Course Code	PEMRT522	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	PBMRT404	Course Type	Theory

Course Objectives:

1. Equip students with a comprehensive understanding of engineering design principles, including material selection, manufacturability, process capability, and form design.
2. Enable students to apply sustainable and environmentally responsible design practices, focusing on recyclability, energy efficiency, and minimizing environmental impact.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	Engineering design: Concept – Kinds of design – Design process steps – Factors influencing design – Concurrent Engineering – Material selection process – Evaluation methods for material selection. General design principles for manufacturability: strength and mechanical factors, mechanisms selection, evaluation method	9
2	Factors Influencing form Design: Working principle, Material, Manufacture, Design- Possible solutions, Materials choice, Influence of materials on form design. Process capability: Feature tolerances, Geometric tolerances, Assembly limits, Datum features, and Tolerance stacks. Process capability analysis – Centrality analysis – Compound assembly – Selective and Interchangeable assembly – Grouped Datum systems.	9
3	Design for machining: Design features to facilitate machining using drills, milling cutters, keyways, Doweling procedures, Reduction of machined	9

	area, simplification by separation, simplification by amalgamation, Design for machinability, Design for economy, Design for accessibility, Design for assembly, Design for disassembly.	
4	Design for the Environment: Introduction, Basic DFE methods, Design guide lines, Example application, Lifecycle assessment, Basic method, Environmentally responsible product assessment, Weighted sum assessment method, Lifecycle assessment method, Techniques to reduce environmental impact, Design to minimize material usage, Design for recyclability, Design for remanufacture, Design for energy efficiency.	**9**

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply the knowledge of General design principles for manufacturability	**K3**
CO2	Identify Factors Influencing form Design, improve process capability and use Selective and Interchangeable assembly to simplify designs.	**K2**
CO3	Identify uneconomical design of casting and welding, Modify the design, and design better castings, welded joints and brazing and soldering joints.	**K3**
CO4	Simplify Design features to facilitate simplicity in different machining processes and apply design principles for machinability, assembly and disassembly.	**K2**
CO5	Apply the knowledge of Design for energy efficiency and less environmental impact	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

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CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

2	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3									2
CO2	3		3									2
CO3	2		2									2
CO4	2		3				2					2
CO5	3	2				2						2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Design: A Materials and processing Approach	Dieter, G.E.	McGraw Hill Co. Ltd	2000
2	Assembly, Automation and product design	Boothroyd, G.	CRC press	2005
3	Product Design	Kevien Otto and Kristin Wood	Pearson Publication	2004
4	Product design and development	Ulrich, K.T. and Eppinger, S.D.	Tata McGraw Hill	
5	Design for Manufacturability Handbook	James G. Bralla	McGraw-Hill companies, New York, USA	Second Edition, 1998
6	Design for the Environment	Fixel, J.	McGraw Hill	1996

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Product Design for Manufacture	Boothroyd, G, Heartz and Nike	Marcel Dekker	1994
2	Engineering Design and Design for Manufacture and Structural Approach	Dickson, John. R, and Corroda Poly	Field Stone Publisher, USA	1995
3	Design for the Environment	Graedel T. Allen By. B	Reason Pub.	1996
4	Engineering Design	Eggert, R.J.	Pearson Education, Inc. New Jersey	2005
5	Engineering Design for Manufacture	KalandarSaheb, S.D and Prabhakar, O.	ISPE	1999.

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://youtu.be/lYvyQ0sXrrU
2	https://youtu.be/lYvyQ0sXrrU
3	https://youtu.be/lYvyQ0sXrrU
4	https://youtu.be/lYvyQ0sXrrU

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